

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1]

[1916

I.—CYCAS THOUARSII.

O. STAPP.

In a letter to Kew, giving an interesting account of Sir John Kirk's garden at Zanzibar, Miss C. D. M. Thackeray, the present owner of Shamba la Balози, drew attention to another Cycad besides *Encephalartos Hildebrandtii* (see *K.B.*, 1914, pp. 386-392) also planted by Sir John Kirk, bearing very graceful long fronds with narrow pinnules which are perfectly smooth and lighter in colour than those of the *Encephalartos*. Miss Thackeray adds that the plants occasionally produce seeds, and that the formation of side shoots is uncommon.

This Cycas is repeatedly mentioned in Sir John Kirk's letters, and sometimes called by him the "cernuum cycas," no doubt on account of the somewhat drooping fronds. He became familiar with it in the delta of the Zambesi, where he observed and collected it on the Luabo distributary, and along the coast between the Kongoni and Melambe mouths in 1858 and 1859; but all the specimens he came across there were female. When in 1861 he visited the Comoro Islands he found it growing "anywhere" on Mohilla, and forming stems 15 feet high (letter of 21st April, 1861), and sent excellent herbarium specimens to Kew. In the following year, writing from Johanna in the Comoros, he remarked that this "Cycas is very common on the hillsides, from the coast to nearly 2000 ft. It has a trunk 18-20 ft. high." Writing from Zanzibar in 1877, he says: "We have the *C(ycas) circinalis*? or one like it. It grows nearer us than the *Encephalartos* which comes from the coast some distance off." Then, in 1878, he writes again: "There are 'cernuum' (cycads) at Mombasa, but that is a long way off. However, I will get you a 5 ft. stem, I hope. In the meantime I shall try for our (*i.e.*, the Zanzibar) cernuum Cycas, which may or may

not be the same as that of Johanna." Sir John did send a plant the same year, but it does not seem to have lived long. He also planted several in his garden in Zanzibar, and some of his observations on the generation of heat in male cones of cycads (*K.B.*, 1914, p. 390) were made on these. The following reference in a letter of March 5th, 1879, is probably to one of them: "I have a splendid *Cycas Thouarsii* 12 ft. high in lovely foliage at my country place." This note shows that he had at last obtained the identification of the plant.

The history, taxonomic status, nomenclature and distribution of the species is to some extent obscure, and it may be useful to set out briefly what is actually known.

The name *Cycas Thouarsii* [*sic!*] appears for the first time in R. Brown's *Prodromus* (1810), p. 347, in the "Observationes" following the diagnosis of the family *Cycadeae*. A mark of interrogation and the apposition "*Indiæ orientalis*," are added to the name*. This species and *C. angulata* are compared with *C. circinalis* "*vera*," and certain differences in the structure of the seed are pointed out. On the same page under *Cycas* the author, before passing on to the Australian species, says: "Sub nomine *Cycadis circinalis* plures species procul dubio confusae, e vivis solummod extricandae. Duæ in India (p. 348) orientali proveniunt, quarum altera *Cycas circinalis vera*, ex synonymo Rheedii, et icone ineditâ zeylanica Hermanni; altera a planta Madagascariensi D. Du Petit Thouars, vix diversa."

Petit Thouars in his memoir "*Histoire des Végétaux recueillies sur les Isles de France, La Réunion et Madagascar*" (1804), p. 2, identified as *C. circinalis*, L., the plant to which R. Brown alludes as *Cycas Thouarsii*?. He considered it identical with the *Cycas* he saw in Madagascar, which, he says, is known there as "*Samble*." His observations on the germination and fructification of the plant were, however, made in Mauritius (l.c., p. 12), and his figures were therefore, at least in part, drawn from specimens growing in that island. According to De Candolle (*Prodr.* xvi. ii. p. 529) there is in Petit Thouars's herbarium in Paris only one female specimen extant "*cum germinatione vel foliis junioribus, sine origine cognita aut schedula auctoris*." However that may be, the figures of the male and female sporophylls are sufficient to prove that the plant of Petit Thouars was not the *Cycas circinalis* of India represented by Rheede's Todda Panna (*Hort. Malab.* iii, tab. 13-21), the accepted basis of Linnaeus's species. L. C. Richard in his great memoir "*Commentatio Botanica de Coniferis et Cycadeis*," published posthumously by his son Achille in 1826, figures on tab. 25 and 26, under the name *Cycas circinalis*, what is evidently the same plant as that of Petit Thouars. In fact, some of the figures might have been made from the specimens which served Petit Thouars for his illustrations. On the other hand the figures of tab. 24 of the same work represent the true *C. circinalis* and are in fact mostly (figs B-D) copies from Rheede's *Hortus Malabaricus*.

* *India orientalis* is frequently used by the earlier authors to include Madagascar and the Mascarenes.

Miquel in 1840, in his "Commentarii Phytographici," p. 127, definitely distinguished the plant of Petit Thouars from the Indian *circinalis*, naming it *C. madagascariensis*. His description is, however, only a condensed circumscription of Petit Thouars's account of the plant. Two years later in his "Monographia Cycadearum," pp. 32, 33, Miquel emended his description from L. C. Richard's description of *C. circinalis* which he thought referred entirely to Petit Thouars's plant. But it has already been pointed out that the habitus figures published by Richard were those of the true *C. circinalis* and so was also the corresponding part of his description. Miquel's emended description of *C. madagascariensis* is therefore wrong to that extent.

In his 'Epicrisis Systematis Cycadearum' (1849)* Miquel, reverting to the species, took up R. Brown's name *Cycas Thouarsii* which he had previously overlooked. The paper contains only a brief diagnosis of the species which corresponds to Petit Thouars's plant. In a paper entitled "Nouveaux matériaux pour servir à la connaissance des Cycadées" Miquel, in 1868†, once more used R. Brown's name in the place of his own name *C. madagascariensis*. Meanwhile De Candolle had worked out the *Cycadaceae* for the Prodrômus (vol. xvi. ii. 1868, pp. 528-547). Following Miquel, he accepted R. Brown's earlier name *C. Thouarsii*, but as he had seen no specimens of the plant and as he was aware of the somewhat contradictory evidence contained in the literature relating to this *Cycas* he placed it among the "Species minus notae" with this remark: "Num sit *C. Rumphii* vel *C. circinalis*, vel propria species, hoc ulterius Parisiis investigandum esset. Spadix femineus crenatus in icône Pet. Th. figuratus a formis indicis omnino differt." Nor was De Candolle certain that the species is really a native of Madagascar, although he considered it "in Comores vere spontanea." This seemed to him evident from the communication he had received from Brongniart concerning the Paris material of *C. Thouarsii*, which according to this authority consisted of (1) a female specimen in Petit Thouars's herbarium "cum germinatione vel foliis junioribus" without indication of origin or author's label; (2) a specimen by Commerson, written up "*C. circinalis* L. Samble de Madagascar. Au Réduit, 1769," and leaves with a label by Desfontaines "Madagascar. Commerson"; (3) specimens collected by Boivin‡ in the islands of Anjouan (Johanna) and Mayotte. I have not seen any of these specimens, but would call attention to the following considerations. Petit Thouars speaks distinctly of his *Cycas* as the "Samble" of Madagascar, (l.c., p. 2) and says that he never saw its seeds being eaten in Madagascar, from which it may be safely inferred that he came across it in that island, although no doubt his observations as stated by Jussieu and L. C. Richard, were made in Mauritius. Commerson, 30 years before Petit Thouars, also knew it as the "Samble de Madagascar," though he, too, found it growing at Réduit in Mauritius. It has since been collected in "Central

* In Tijdschr. v. Wis. en Nat. Wetens. II. p. 287.

† In Archives Néerlandaises, III. p. 236.

‡ This would have been probably in 1847.

Madagascar" by Baron (No. 2163 in Herb. Kew), and although no particular locality is indicated on this label, Baron, in his paper "The Flora of Madagascar" mentions it as one of the elements of the flora of the littoral belt of his eastern region* while Drake del Castillo, in 'Madagascar au debut du xx^e siècle' (1902), p. 117, describes it as covering and ornamenting vast expanses along the east coast. The occurrence of *C. Thouarsii* there is also borne out by a specimen collected by Perrier de la Bathie between Vohémar and the Matitana River (Lat. 14° S.) and communicated recently by Professor H. Jumelle. It was precisely this eastern region, particularly the neighbourhood of Foule Point (Petit Thouars) and Fort Dauphin (Commerson) which Petit Thouars and Commerson visited. Baron's specimen and the occurrence of Betsileo and Hova† names for the *Cycas* suggest that from here the species extends some distance inland. The figure of a *Cycas* (named *C. circinalis*) from the banks of the Samberanou River (about Lat. 14° S.) on the north-west coast, given in Pollen et Van Dam 'Recherches sur la Faune de Madagascar' vol. i. pl. 19 (1869) probably also represents Petit Thouars's plant. On the other hand, its occurrence in the wild state in Mauritius is more than doubtful. Commerson's specimen came from Réduit, the residence of the Governor, where there is an old garden; it was very probably cultivated there, and we may assume that this was also the case with Petit Thouars's *Cycas*. Bojer in 'Hortus Mauritianus' quotes (p. 301) "*C. circinalis*, au Jardin du Roi, PAMPL. et à la Rivière Noire," and gives as vernacular names Faux Sagoutier and Fabou (Malg.). The latter is evidently the Faho of the Betsileo dialect quoted by Heckel. In any case there is no evidence of *Cycas* occurring in the spontaneous state in the island. Boivin's discovery of the *Cycas* in the Comoros was confirmed by Kirk in 1861 (Mohilla) and 1862 (Johanna) and by Hildebrandt in 1875 (Johanna). The latter sent home some stems all of which, however, perished, and several hundred fresh seeds. Of these, so far as they were sown, 19 per cent. germinated—the time between sowing and germination differing very much (5 months in extreme cases); but it does not seem that they ever got beyond the stage of the bursting of the testa and possibly the formation of roots‡. This would be quite in accordance with subsequent experience in France where M. Landry, of Paris, experimented with a large number of seeds received from Humblot, who had brought them from the Comoros in 1885. Some of these seeds germinated almost at once, others after a more or less prolonged delay, while many perished without showing any trace of development. Some of those which germinated, did so normally, but the majority developed roots only. Duchartre§

* In Journ. Linn. Soc. vol. xxv. p. 268.

† Faho and Voafaho (Betsilea) and Voafako (Hova); see Heckel, Plant. Util. in Ann. Mus. Col. Marseill. 2^{de} ser. vol. viii. (1910) 328.

‡ See A. Braun in Verh. Bot. Ver. Brandenb. 26. Nov. 1875, p. 15 and Sitz. Ges. Naturf. Freunde, Berl. 17 Oct., 1876, p. 114.

§ Journ. Soc. Nat. Hort. France 3^e ser. vol. ix. (1887) 48 and in Bull. Soc. Bot. France xxxv. pp. 243-251.

who examined the latter established the fact that they were all destitute of embryos and that the roots sprang from the fleshy albumen from towards the top of the seed. All these rooting seeds died without giving rise to any aerial organs; whether any of the normal seedlings grew up is not stated. Bruant, a nurseryman of Poitiers, who also received some of Humblot's seeds seems, however, to have been successful; in his catalogue (no. 195) for 1888 he offered for sale young plants having 2 or 3 leaves. He considered the plant a new species and named it *C. comorensis*.

Kirk's discovery of this *Cycas* on the African mainland in the delta of the Zambesi has already been mentioned, and there can hardly be any doubt that it is really spontaneous there; though as to its occurrence in the Zanzibar region it may be pointed out that Werth in his 'Vegetation der Insel Sansibar' (p. 94) says, "*Cycas circinalis*," is frequently brought from the Comoros to Zanzibar and grown as an ornamental plant in the gardens of the Arabs. On the other hand it may be really indigenous on the coast opposite Zanzibar, as Bley * states that it grows in the forests of Usungula on the Kingani River, 50 miles inland from Dar-es-Salaam, that is on the inner edge of the extensive low level forest area which covers a great portion of Usaramo from the coast to near the meridian of Usungula. No specimens, however, have come to hand from this region. Apart from this area the range of the species may be said to extend over a considerable portion of the east coast of Madagascar, and probably also over parts of the central regions of the island, over the Comoros and the coast of the southern part of the Zambesi delta.

So far the status of this *Cycas* as a species has not been questioned. In the first place, however, it will be expedient to decide the question of the name which should be given to it. Bruant's name *Cycas comorensis* may be dismissed at once as unnecessary; the decision lies only between *C. Thouarsii* of R. Brown and *C. madagascariensis* of Miquel. The plant is so generally known as *C. Thouarsii* that to replace this name by Miquel's would be most inconvenient. Robert Brown's designation has usually been treated as a *nomen nudum* and De Candolle says explicitly that it was published without description. Were this the case, those who accept the rules of the Vienna Code as binding will have to decide for *C. madagascariensis*. The case, however, appears to the writer to be this. R. Brown recognised that Petit Thouars's plant differs from the Indian plant which Linnaeus named *Cycas circinalis*. But Brown did more than this: he contrasted the two species quite clearly (see Prodr. p. 347). While it is true that Brown did not formally describe *C. Thouarsii*, he referred to Petit Thouars's memoir and implicitly stated the synonymy which technically would have been expressed thus: *C. Thouarsii*; syn. *C. circinalis*, Petit Thouars, non Linn., the synonym with its description and illustration doing duty for a fresh description under the new name. It is impossible to contend that any

* Bley, Deutsche Pionierarbeit in Ost-Afrika 1891; from quotation in Engler, Pflanzenwelt Ost-Afrikas, p. 172.

doubt exists as to what R. Brown meant by his *Cycas Thouarsii*, and this name may very well be accepted as valid.

That Du Petit Thouars applied the name *C. circinalis* to the plant whose germination and fructification he had studied is not surprising when we consider the very imperfect knowledge of the genus which the botanists of his time possessed and when we take into account the fact that he was in no way concerned with the taxonomic aspect of the subject. When C. L. Richard's paragraph on *C. circinalis*, with its singular confusion of the Indian and the African plants, was actually written we do not know, and, the work having been published posthumously, little stress can be laid on the author's views. But as soon as systematists like Robert Brown and Miquel took the matter up they recognised the discrepancies between Petit Thouars's plant and the true *C. circinalis*. De Candolle, however, with the conflicting evidence of the earlier authors and no actual specimens before him, left the question undecided, but brought in *C. Rumphii* as a possible synonym. Subsequently, in 1876, A. Braun, relying on Hildebrandt's specimens, accepted it as a distinct species, closely allied to *C. Rumphii** and mainly characterised by its large seeds. The same year, unaware of Hildebrandt's collection or of A. Braun's papers, E. Regel in his revision of *Cycadaceae* reduced *C. madagascariensis*† and *C. Rumphii* to *C. circinalis* giving no reason for so doing; this, too, without including Madagascar in the area of his species which is simply described as India orientalis. The same view is also expressed by Thiselton-Dyer in a note in the Challenger Report, Botany, vol. i. iii. (1885) p. 207, where *C. circinalis* is said to be known from "Western Tropical Africa and Madagascar (*Cycas Thouarsii*, R. Br., Prodr. xvi. p. 528), and from Malabar and Ceylon, perhaps also the Nicobars" and "Miquel . . . records it from the coast districts of Java, Sumatra, Borneo, Timor and the Moluccas." In Eichler's elaboration of the *Cycadaceae* in the *Natürliche Pflanzenfamilien*, vol. ii., i. p. 21 (1889), *C. Thouarsii* is retained as a distinct species closely allied to *C. circinalis* and *C. Rumphii*. Then again in 1895 it is included in *C. circinalis* by Engler in *Pflanzenwelt Ost-Afrikas*, C. p. 422; but when a few years later Warburg studied the group more thoroughly, he came to the conclusion that *C. Thouarsii* should be treated as a distinct species‡. A middle course was finally attempted by Engler who has treated it as a subspecies of *C. circinalis*.

In order to show clearly the contrasting characters of *C. Thouarsii*, *C. Rumphii* and *C. circinalis* these may be set out in parallel columns. The macroscopic characters are taken mainly from the material available at Kew and, excepting where extremes are given, represent average features; the figures for the height of the plants are quoted from literature. For the microscopic characters Mr. W. B. Turrill is responsible.

* Sitz. Ges. Naturf. Freunde, Berl. 17 Oct., 1876, p. 113.

† The name *C. Thouarsii* is not mentioned by Regel at all, nor is there any reference by him to the paper by Du Petit Thouars or the memoir by C. L. Richard.

‡ Monsunia, vol. i., p. 180, 181.

Macroscopic characters.

	Thouarsii.	Rumphii.	circinalis.
Height of stem	Up to 6 m. ...	Up to over 6 m. (occasionally to 15 m.; begins to flower when barely 2 m. high)	Up to 5 m. (occasionally 12 m.).
Fronds	Up to over 1 m. long	1-2 m. long ...	1.5 to 2.5 m. long.
Spines of petiole	1-1.5 cm. apart ...	2-3 cm. apart ...	1-2 cm. apart.
Number of pinnae	Up to 65 ...	50-70 ...	80-100.
Distance of pinnae	1 cm. apart ...	1.2-1.5 cm. apart ...	
Shape and dimensions of pinnae	Gently curved, linear, 20-30 cm. by 0.8-1.4 cm.	Rather straight, linear, 20-30 cm. by 15-17 mm.	Gently curved, linear 18-24 cm. by 0.9-1.3 cm.
Midrib of pinna when dry	Grooved above ...	Grooved above ...	Not grooved above.
♂ sporophylls	Acumen short, abruptly recurved	Acumen reflexed or recurved	Acumen long, gradually tapering.
♀ sporophylls	Blade ovate-lanceolate, crenulate	Blade short, oval, sparingly and minutely toothed or serrate, rarely lobed, from a terete narrow claw	Blade long acuminate, serrate with numerous, sharp narrow teeth, from a flat broad claw.
Seed	Ellipsoid-globose, up to over 6 cm. long	Ovoid to subglobose, 5-7.5 cm. by 3.75-4.3 cm.	Ovoid to globose 2.5-5 cm. in diam.

Microscopic characters.

	Thouarsii.	Rumphii.	circinalis.
Pinna half-way between midrib and margin	Zambesi mouth, Kirk Palisade cells forming half the section which is 0.5 mm. in width. There are 3 or 4 layers of accessory transfusion tissue and 2 layers of spongy parenchyma cells. A well developed cuticle is present on the upper epidermis and a less developed one on the lower. The stomata are numerous and occur on the lower surface only.	Singapore, Ridley 4408 Palisade cells forming more than half the section which is about 0.5 mm. in width. There are 4 or 5 layers of accessory transfusion tissue and 1 layer of spongy parenchyma cells. The cuticle is very strongly developed above and is distinct below. The numerous stomata are limited to the lower surface	Bangalore, J. Cameron 497. Palisade cells forming half the section which is about 0.25 mm. wide. There are about 2 layers of accessory transfusion tissue and 1 layer of spongy parenchyma cells. The cuticle is not well developed on either side. The stomata are numerous on the lower surface and on the sides of the midrib.
Margins of the pinna	Slightly revolute, with 3 or 4 layers of sclerenchyma and a very strong cuticle	Very slightly revolute, with one layer of sclerenchyma forming a hypodermis and a very strong cuticle	Very slightly revolute, with very little sclerenchyma and a strong cuticle.
Midrib of pinna	With furrows and small median ridges on both sides. A little thick-walled sclerenchyma is present on both sides of the bundle	Concave above and convex below, with a thickened hypodermis and a very inconspicuous thickened sheath round the bundle	Convex above and slightly concave below, with a slightly thickened sheath but no definite sclerenchyma.

No doubt the characters given in the table may have to be amended in details when tested on more ample material than is at present available, but at the same time they make it perfectly clear that the affinity of *C. Thouarsii* lies with *C. Rumphii* rather than with *C. circinalis* which contrasts markedly with both. Whether *C. Thouarsii* and *C. Rumphii* should be treated as sub-species of one species, in which case the name *C. Thouarsii* would have priority over the *C. Rumphii*, depends more or less on whether a wide or narrow conception of the species be taken. But nothing would be gained by merging them in one species whilst the important fact of their inhabiting two areas so widely separated would run the risk of being obscured. For practical purposes they will always have to be treated as distinct entities.

II.—AFRICAN MORINDAS.

J. HUTCHINSON.

In the Flora of Tropical Africa (vol. iii. pp. 191-2), Hieron describes two species of *Morinda* (*Rubiaceae*), *M. citrifolia*, Linn., and *M. longiflora*, G. Don.

Under "*M. citrifolia*," according to Hieron's conception, I find there are two distinct species represented, neither of which can be said to agree with *M. citrifolia*, Linn., an East Indian, Malayan and Polynesian species. The points in which these two African species, *M. lucida*, Benth., and *M. geminata*, DC., differ from each other and from the true *M. citrifolia* are shown as follows:—

***M. citrifolia*, Linn.;** stipules large and foliaceous, mostly persistent; peduncles solitary, shorter or as long as the fruit-body.

***M. geminata*, DC. (= *M. citrifolia*, Hieron, partly, not of Linn.);** stipules small and persistent, never foliaceous; peduncles almost invariably paired, becoming thickened and elongated in fruit and much longer than the fruit-body.

***M. lucida*, Benth. (= *M. citrifolia*, Hieron, partly, not of Linn.);** stipules large and foliaceous, but soon deciduous; peduncles paired or in threes, long and slender, much longer than the fruit-body.

Morinda citrifolia, Linn., is much cultivated in India on account of certain economic properties. From its roots the *A'l* dye of commerce, a fast dull red dye, is obtained (see Watt, Dict. Econ. Prod. India, v. 260-75).

It is very probable that one of the African species, *M. geminata*, may have the same properties as the eastern plant, and from this standpoint would perhaps merit the attention of West African foresters. Both are used in medicine by the inhabitants of their respective countries, chiefly as a tonic and febrifuge (see note under *M. geminata*).

In "*M. longiflora*," of Hieron, there are also two quite distinct species, the true *M. longiflora*, G. Don, and *M. confusa*, Hutchinson. The latter has been described by Mr. Baker as *Gaertnera morindoides* (*Loganiaceae*), but it is undoubtedly a

true *Morinda*. It seems advisable, however, to use a new specific name for this plant in preference to *morindoides*, owing to its incongruity in combination with the generic name *Morinda*.

Kew is much indebted to Mr. C. E. Lane-Poole, Conservator of Forests, Sierra Leone, for abundant material of flowers and fruits, in formalin, with information relating to the three species which occur in that colony. According to Mr. Lane-Poole all these *Morindas*, with the exception of *M. lucida*, which is not known from farther north than the Gold Coast, are distributed throughout the rain-forest areas of Sierra Leone, but have not so far been found in the savannah country.

CLAVIS SPECIERUM AFRICANARUM.

Frutices scandentes; pedunculi terminales vel ramulos laterales breves terminantes, nec oppositifolii; flores 6-7-meri:—

Pedunculi geminati; corollae tubus elongatus gracilisque, faucibus dense villosus vel pubescens, rarius fere glaber; ovarium glabrum; fructus turgidus, calycibus persistentibus 2-4 cornutus ... 1. *M. longiflora*.

Pedunculi solitarii; corollae tubus praecipue alabastro brevis crassusque, faucibus glaber; ovarium plerumque puberulum; fructus calycibus persistentibus crasse plurimobonatus ... 2. *M. confusa*.

Arbores vel frutices multe ramosi, nec scandentes; pedunculi oppositifolii et interdum etiam terminales; flores 5-meri:—

Ramuli graciles, plus minusve teretes; stipulae magnae et foliaceae, mox deciduae; pedunculi elongati gracilesque; alabastra gracilia; fructus 2-5 cm. diametro vel minus ... 3. *M. lucida*.

Ramuli robustissimi, quadrangulares; stipulae parvae et persistentes; pedunculi et alabastra robusta; fructus 3-6 cm. diametro ... 4. *M. geminata*.

M. longiflora, *G. Don*, Gen. Syst. iii. 545; Hiern in Oliv. Fl. Trop. Afr. iii. 192, partim. *Descript. emend.*

Frutex scandens, usque ad 3 cm. altus, floribundus; rami elongati, graciles, leviter costati, ceterum teretes, glabri. *Folia* petiolata, oblongo-elliptica vel obovato-elliptica, basi breviter cuneata, apice subabrupte vel abrupte acuminata, acumine obtuso circiter 1 cm. longo, 6-12 cm. longa, 2-7 cm. lata, coriacea, glabra, interdum utrinque subnitida; nervi laterales utrinsecus 5-6, arcuati, a costa media sub angulo 45°-65° abeuntes, infra prominentes, intra marginem arcuatim anastomosantes; venae infra laxe reticulatae, prominentes; petioli 0.5-1.5 cm. longi, glabri; stipulae brevissimae, mucronatae. *Flores* albi, fragrantés; pedunculi terminales, geminati vel rarius 3-4-nati,

aequales, 0.5-1.5 cm. longi, plerumque graciles, glabri, 3-5-flori. *Receptacula* ima basi inter se adnata, circiter 3 mm. longa,



M. longiflora, G. Don.

A. apex of branchlet showing paired peduncles; B. fruits:—nat. size.

margine leviter cartilagineo-undulata, glabra. *Corolla* longe tubulosa, in alabastro leviter curvata, 4-8 cm. longa; tubus ad apicem parum expansus, medio circiter 2.5 mm. diametro, extra minutissime puberulus, faucibus dense pubescens vel villosus; lobi plerumque 6, lineari-lanceolati, subobtusiusculi, crassi, usque ad 2.5 cm. longi, glabri. *Antherarum* apices vix exserti; loculi 5 mm. longi. *Stylus* brevissime vel vix exsertus, glaber. *Fructus* non lobatus, turgidus, 2-3 cm. diametro, calycibus persistentibus tubulosus 2-4 ornatus.

DISTRIB.—Sierra Leone to Fernando Po and the Cameroons:—Sierra Leone: Kessewe Reserve, Apr., fls. and fr., *Lane-Poole* 132; near Ninia, Talla Hills, about 2000 ft. alt., Feb., *Scott Elliot* 4901; Mano, *Thomas* 9969; 10000; 10258; 10263; 10315; 10386; without precise locality, *Don*. Gold Coast: Kwahu, 2000 ft. alt., Apr., *Johnson* 667. Nigeria: Eket district, *Talbot* 3255; Oban, *Talbot* 205. Fernando Po: banks of the river, June, *Mann* 411; 2341; *Barter* 2061. Cameroons: Bipinde, *Zenker* 2361; 4636. "West Africa," *Whitfield*.

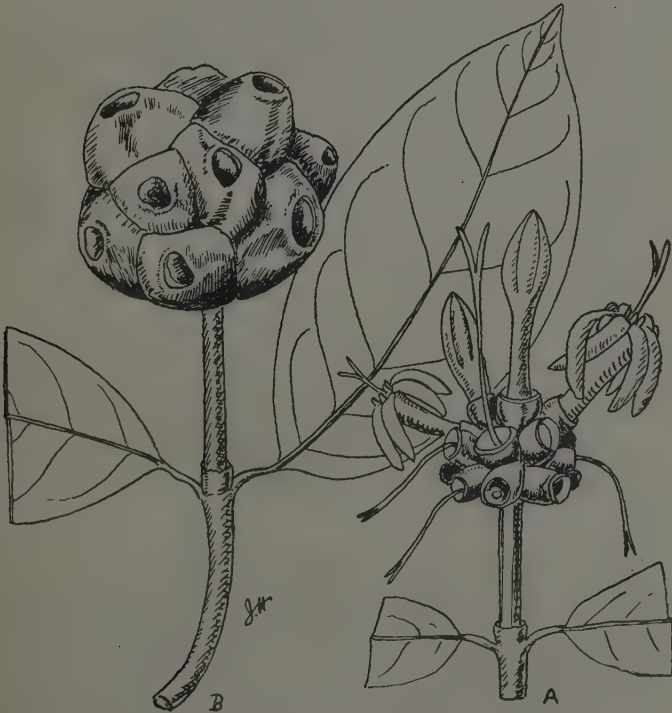
Vernacular names—*Leverek beni* and *Benti* (*Lane-Poole*).

2. *M. confusa*, *Hutchinson*, nom. nov.

M. longiflora, Hiern in Oliv. Fl. Trop. Afr. iii. 192, partim, et in Cat. Afr. Pl. Welw. 1492; Stapf in Johnston, Liberia, 613; non G. Don.

Gaertnera morindoides, Baker in Kew Bull. 1892, 83.

Frutex scandens vel subscandens; rami graciles, subteretes vel sicco parum sulcati, glabri. *Folia* petiolata, elliptica, oblongo-elliptica vel late elliptica, basi brevissime cuneata, apice plerumque breviter et obtuse acuminata, 6-15 cm. longa, 3-8 cm. lata, tenuiter chartacea, utrinque glabra, leviter nitida; nervi laterales utrinsecus circiter 6, arcuati, a costa media sub angulo 45°-60° abeuntes, supra prominuli, infra prominentes, intra marginem anastomosantes; venae infra prominenter reticulatae; petioli 0.5-1.5 cm. longi, glabri; stipulae tubulosae, truncatae, circiter 2 mm. longae, coriaceae, glabrae. *Flores* albi vel flavo-virides; pedunculi terminales, solitarii, circiter 15-flori, 1-2.5



M. confusa, *Hutchinson*.

A. apex of branchlet showing solitary peduncle; B. fruit:—nat. size.

cm. longi, demum (in fructu) incrassati et indurati. *Receptacula* inter se basi adnata. *Calycis* tubus truncatus, 4 mm. longus, carnosus, plerumque puberulus. *Corolla* breviter tubulosa, in alabastro recta et crassa, usque ad 3 cm. longa; tubus medio circiter 0.5 cm. diametro, extra glaber vel minute puberulus,

intra, glaber; lobi 6-7, lineari-lanceolati, subobtus, circiter 1 cm. longi, 3-4 mm. lati, carnos, glabri. *Apices antherarum* leviter exsertae; loculi 6 mm. longi. *Stylus* circiter 3 cm. longus, exsertus, bilobus, lobis 6-7 mm. longis. *Fructus* maturus ambitu depresso-globosus, 4 cm. diametro, prominenter et alte pleriumbonatus.

DISTRIB.—Sierra Leone through the coast forest districts to Angola and in the N.E. Belgian Congo:—Sierra Leone: Balso Farm, Dec., *Scott Elliot* 4186; near Ninia, Talla Hills, about 2000 ft. alt., Feb., *Scott Elliot* 4901; Bagroo River, Apr., *Mann* 810; within a belt of 45-70 miles of "Sierra Leone" [Freetown?], *Garrett* 28; Kambui Reserve, Mar., *Lane-Poole* 193; various localities, *Thomas* 113; 5626; 5686; 5748; 8023; 8470; 8509; 8840; 9766; 10390. Liberia: within 6 miles of Monrovia, *Whyte*; without precise locality, *Farmer* 347. Gold Coast: Aburi, *Johnson* 1069; sea-beach at Bushua, near Dixcove, Apr., *Chipp* 178; Kumassi, *Cummins* 43. French Guinea: Bilima, *Chevalier* 14690. Nigeria: Lagos, *Maloney*; Botanical Station, *Millen* 168; interior of Western Lagos, *Rowland*; Eppah, *Barter* 3272; without precise locality, "Ojuologbo vine," *Imperial Institute specimen* no. 6. Cameroons: Batanga, July, fls., *Bates* 333; without precise locality, *Braun*. Fernando Po: Nov., *Vogel*, 188. Gaboon: Gaboon river, *Mann*. North East Belgian Congo: Niamniamland; on the Jura river, Mar., *Schweinfurth* 3334. Angola: Golungo Alto; near Ponte de Felix Simões, Nov., fl., *Welwitsch* 4757; borders of forests close to the river Delamboa, Jan., fls., and by the Ambaca road at Camilungo, Sept., fr., *Welwitsch* 4758.

Scott Elliot says that this plant is known in Sierra Leone as *Ogidogbo*, and is a well-known native medicine for fever, and recognised as being very efficacious. Mr. Lane-Poole informs us that the Mendi name is *Wawae*, and a decoction of the leaves is used for stomach trouble and is particularly suitable for expelling worms.

3. *M. lucida*, *Benth.* in Hook. Niger Flora, 406 (1849).

M. citrifolia, *Hiern* in Oliv. Fl. Trop. Afr. iii. 191, partim, non Linn. *M. citrifolia*, var. *lucida*, *Hiern* in Cat. Afr. Pl. Welw. i. 492.

DISTRIB.—Gold Coast to Angola and North-East Tropical Africa:—Gold Coast: Axim, white-flowered tree, Nov., *Chipp* 21; without precise locality, *Brass*; *Evans* 25; Togoland: Marsch, May, *Krause*; near Lome, *Warnecke* 177; Sokode, Apr., *Kersting* 64; Togo, *Bauman*, 141; Nigeria: Western Province; Lagos, *Maloney*; Ibadan Road, tree 15 ft. high, *Millen* 106; Ikirinu, *Millson*; Abeokuta, small tree with white flowers, *Barter* 3388; *Irring* 70; Central Province; Onitsha, *Barter* 1234; 1753; Eastern Province; Cross River Division. large straight-boled tree, *Uwett*, *McLeod*; Inkum and Ekom, Jan., *Holland* 240. Eket district, *Mr. and Mrs. P. A. Talbot*, 3233; 3148; Engilea, Mar., *Kitson*. Fernando Po: *Barter* 2039; *Vogel* 77; Cameroons: Cameroon River, tree 80 ft., Jan., *Mann* 717; Bipinde, *Zenker* 2322; 2521; 2656. French Congo: Brazzaville, Dec., *Chevalier* 11200; without precise locality, *Smith* 47. Princes Island: in

forests about Pico Papagais, *Welwitsch* 4756. Angola: Barra do Bengo; banks of the river Bengo, near Santo Antonio, Dec., *Welwitsch* 4755; Golungo Alto; banks of the river Delamboa, May, *Welwitsch* 4754; Malange district, *Gossweiler* 1231; Cazengo district; near the railway line at Senge de Stombe, *Gossweiler* 760. Monbuttuland: between Rapili and Kibali, Apr., *Schweinfurth* 3658. Uganda: Kampala and environs, *Whyte*; on hills near Kampala, Feb., *Scott Elliot* 7295, 7371; Entebbe, *Mahon*; near the Semliki river, 2300 ft., Nov., *Bagshawe* 1297.



M. lucida, Benth.

A. flowering shoot showing the three peduncles opposite the leaf; B. fruit:—
nat. size.

USES.—Used by the natives in dysentery and fever, ascertained by Dr. Beswick to be powerfully astringent (*Barter*, 1234); yellow dye obtained from the tree (*MacLeod*); bitter and astringent, used by the people with good effects in dysentery (*Barter*, 2039); timber used by negroes for building their huts.

VERNACULAR NAMES—*Eruwo* (*Millson*); *Guigo* (*Welwitsch*, 4756) and *N-golo-mugi* (*Welwitsch*, 4754).

According to *Welwitsch* this is a beautiful tree, remarkable for the peculiar lustre of its foliage and the abundance of its white fragrant flowers. *Gossweiler* describes it as a tree 40 ft.

high with a trunk about 1 ft. in diameter, much-branched, the branches somewhat drooping and densely leafy, with pure white, aromatic flowers.

M. lucida may be readily distinguished from *M. geminata* by its usually slender and subterete branchlets, its slender peduncles and much smaller flowers and fruits.

4. *M. geminata*, DC. Prodr. iv. 450 (1830).

Psychotria chrysorrhiza, Schum. et Thonn. Pl. Guin. 111 (1827)?

Morinda macrophylla, Desf. Cat. Hort. Par., ed. 3, 404 (1829)?

M. chrysorrhiza, DC. Prodr. iv. 450 (1830)?

M. quadrangularis, G. Don, Gen. Syst. iii. 545 (1834).

M. citrifolia, Hiern in Oliver Fl. Trop. Afr. iii. 191, partim, non Linn.



M. geminata, DC.

A. part of flowering branchlet showing paired peduncles opposite the leaves; B. and C. large and small fruits:—nat. size.

Arbor usque ad 9.5 m. alta, trunco ad 40 cm. diametro; ramuli ultimi robusti, quadrangulares, plerumque circiter 5-8 mm. crassi, glabri, internodiis 4-9 cm. longis. *Folia* late elliptica vel obovato-elliptica, basi breviter cuneata, apice obtuse acuminata, 10-25 cm. longa, 6-15 cm. lata, tenuiter chartacea, glabra vel infra in costa et nervis lateralibus parce pubescentia; costa infra conspicua; nervi laterales utrinsecus 6-8, arcuati, utrinque prominentes; venae laxae, subparallelae, infra conspicuae; petioli 0.5-1 cm. longi, robusti; stipulae interpetiolares, late triangulari-ovatae vel subtransverse oblongae, circiter 5 mm. longae, apicem versus membranaceae. *Pedunculi* plerumque geminati, oppositifolii, robusti, complanato-angulares, 3-8 cm. plerumque 5 cm. longi, 2-4 mm. crassi, glabri. *Capitula* 15-25-flora. *Receptacula* crassa, connata. *Calyces* liberi; tubus cupularis, 2-2.5 mm. longus, margine obscure undulatus,, coriaceus, glaber. *Corollae* in alabastro clavatae, ad 3.5 cm. longae; tubus circiter 2.5 cm. longus, apicem versus leviter expansus; lobi 5, mox reflexi, oblongo-lanceolati, obtusi, carnosii, 1.2-1.4 cm. longi. *Stamina* 5, semiexserta; antherae 5 mm. longae, 1.25 mm. latae. *Stylus* inclusus 1.5 cm. longus, profunde bilobus. *Fructus* magnus, integer vel inaequaliter bilobus vel subtrilobus, depresso-globosus, 3-6 cm. diametro, calycibus persistentibus prominentibus ornatus.

DISTRIB.—Senegambia to Upper French Guinea:—Senegambia: Cayor district; Caniag village, March, *Döllinger* 52. Sierra Leone: Rotomba Island, March, *Kirk*; Ryaham, Feb., *Lane-Poole* 152; road to Sulimania, March, *Scott Elliott* 5278; Bagroo River, *Mann* 717; Victoria, *Thomas* 9080; Gbanbama, *Thomas* 8899; 8970; 9135; 9345; 9477; 9704; Pujehun, *Thomas* 8562; 8625; Mano, *Thomas* 10324; 10373; "Sierra Leone" *Barter*; *Vogel* 143, 145; *Daniell*; *Don*; *Smeathmann & Afzelius*. French Guinea: valley of the Kaba, May, *Chevalier* 13186; Sareya, Feb., *Chevalier* 463.

VERNACULAR NAMES—*N'Jalajui* (Lane-Poole); *Bungbo* or *Bumbo* (Scott Elliot); *Ojuologboo* (from a specimen, no. 8, communicated by the Imperial Institute).

Mr. Lane-Poole informs us "that this species is known in Sierra Leone as the 'Brimstone Bush'; it is never used for timber but for firewood. From a medical point of view it has a great reputation; the *Temnes* and *Susos* boil the leaves and drink the decoction as a purge; it is also used to bathe in when suffering from malaria; a decoction of the roots is given to weakly babies, and they are washed in it to make them grow strong; the *Mendi* man takes the dried leaves and makes a decoction which he drinks when down with malaria; the roots are chipped up and boiled and the liquid strained and mixed with indigo in the dye pot; the *Creole* makes decoctions of both root and leaves for fevers and these are supposed to be particularly efficacious in cases of yellow fever; the leaves are sold in Freetown markets; the plant is very common everywhere and it flowers throughout the year."

The earliest specific name of this plant is very probably *chrysorhiza* (*Psychotria chrysorhiza*, Schum. et Thonn. l.c.) but as the type of this appears to be no longer in existence it seems

advisable to abandon it. Mr. O. Paulsen very kindly made a search for an authentic specimen in the Botanical Museum at Copenhagen, but without result. Another specific name antedating the one here adopted which might very well have referred to the same plant is *M. macrophylla*, Desf. This species was founded on a plant grown in the Paris Botanic Gardens in 1829, but Prof. Lecomte informs us that no dried specimen has been found in the Paris Herbarium. In regard to the examination of the type of *M. geminata*, DC., (1830), M. C. De Candolle very kindly supplied a portion for comparison, and its identity with *M. quadrangularis*, G. Don (1834), has thus been confirmed.

III.—CONIFEROUS TIMBERS.

THE JUNIPERS AND THEIR COMMERCIAL IMPORTANCE.

W. DALLIMORE.

Short descriptions of several kinds of juniper wood were given in *K.B.* 1913, No. 6, pp. 220-222, under the heading "Cedar Woods." In the present article those notes are extended and other species not so well known commercially as cedar are included.

The genus *Juniperus* includes many species of evergreen trees and shrubs widely distributed in the northern hemisphere and occurring south of the Equator in the mountains of Eastern Tropical Africa. They are found throughout Europe, including the British Isles, in Asia Minor, Asia from the Himalaya northwards almost to the limit of shrub life, North America, the West Indies, Northern Africa, East Africa, the Canary Islands and the Azores. The majority are hardy in the British Isles, those from sub-tropical countries usually occurring on the mountains, but a few are too tender for outdoor culture here. They are often of slow growth, and it is doubtful whether any species planted under forest conditions in the British Isles would prove a financial success. Some of the species are dwarf or almost prostrate bushes, whilst others grow into fine trees 70-100 ft. high, and even in the same species considerable variation in habit may occur according to the conditions of climate, altitude and soil. The leaves may be acicular and spreading, or scale-like and pressed close to the branches. The acicular type always obtains in seedlings and in some species prevails throughout life, but in other cases it soon gives place to the scale-like leaves of the adult state, though in several species both kinds of leaves are found on mature plants. The fruits are berry-like, several seeds being enclosed by fleshy resinous scales. In many instances the wood is red or yellow in colour and fragrant. It is sometimes used for building purposes and for cabinets, but its most important use is for the casings of lead pencils, no other kind of wood having been found so suitable for this purpose as the better grades of juniper. When too small or knotty for other uses it forms very serviceable fences. Oil, used for perfumery, etc., is obtained from the

wood by distillation and may also be procured from the leaves and fruits of certain species. Medicinal properties of a diuretic character are possessed by the junipers. The following species are of economic importance:—

J. barbadensis, *Linn.*—Barbados Cedar, Southern Red Cedar.

A species closely related to *J. virginiana* and apparently a southern form of that tree. It is found in the Southern United States and the West Indies (*see K.B.* 1911, p. 377), though now very rare in the Islands. In the Southern United States it often grows in swamps near coastal rivers, and under the best conditions attains a height of 50 ft. with a girth of 6 ft., its average size being 30 ft. The leaves of the adult tree are very like those of *J. virginiana*, but the habit appears to be looser and the branches more pendent. The wood is soft, close-grained, red and fragrant, and it is popular for pencil making when it can be procured in quantity, but during late years the supply has become scarce. From the "Report on the Agricultural Department, St. Lucia," 1914–15, it appears that a small plantation of this species has recently been started at Réunion.

J. bermudiana, *Linn.*—Bermuda Cedar, Bermuda Red Cedar.

This tree is said to dominate the other arborescent vegetation in Bermuda where it grows under a variety of conditions, both in brackish swamps and on limestone hills. Average-sized trees are 40–50 ft. high with a trunk 3–4 ft. in diameter. On adult trees both kinds of leaves are found. The wood is valuable for ship-building and for furniture. Cabinets made from it are said to be highly prized in Bermuda. Some specimens are very prettily marked.

J. californica, *Carr.*—White Cedar, Sweet-berried Cedar, Californian Juniper.

A bush or small tree up to 40 ft. high with a trunk 12 ins. in diameter found wild in California, Arizona, etc. The wood is described as soft, close-grained and light reddish-brown. It is durable and used for fence posts in its native country.

J. Cedrus, *Webb & Berth.*—Canary Island Juniper, Canary Island Cedar, Sabina Tree.

This tree is a native of the Canary Islands where, according to Elwes and Henry, "Trees of Great Britain and Ireland," vi., p. 1414, it ascends the mountains to a height of 7000–9000 ft., sometimes attaining a large size. Mature trees are up to 70–80 ft. high with stout trunks carrying spreading heads of branches with pendent branchlets. The leaves are acicular and the fruits nearly $\frac{1}{2}$ in. in diameter. The wood has been too scarce of late years to be of much commercial value, but it has excellent lasting properties and ranks with the better qualities of juniper wood. Two forms of the species have been mentioned, one more free growing and of looser habit than the other. Conditions of growth have, however, been thought to account to some extent for the difference in habit.

Attention has recently been directed to this species by Dr. G. V. Perez, of Tenerife, who considers it might be planted with advantage under forest conditions for the sake of its

timber. He has sent us the following particulars of young trees growing in his garden 1200 ft. above sea level, and has also sent a quantity of seed for distribution to suitable countries.

"No. 1: a seedling female tree brought from above 'Arafo,' Tenerife, and planted out in 1906 is now 8.61 m. high and 47 cm. in girth. No. 2: A male tree from the same place and of similar age is 6.37 m. high and 37 cm. in girth. No. 3: A cutting struck from No. 1, in the open and afterwards planted out at the end of 1907 or early in 1908 is 6.28 m. high and 25 cm. in girth. No. 4: A female seedling grown from seed obtained in the Island of Palma planted out at the end of 1910 is 5.45 m. high." All the measurements were taken in the summer of 1915. Dr. Perez remarks "*J. Cedrus* is the one (species) that grows the quickest, a fact that may be of great importance considering the imperishable and valuable wood it gives." There does not appear to be any chance of *J. Cedrus* proving a success under forest conditions in the British Isles, for it is generally too tender for our climate even though it may succeed as a decorative tree here and there, but in the West Indies and New Zealand, whence seed has been sent, good results should be obtained. It is interesting to note in comparison that *J. virginiana* in its native country, according to information supplied by Dr. Perez from a reliable American source, increases in height 6-18 in. annually, and that the yearly increment is $\frac{1}{2}$ in. In East Africa trees of *J. procera* planted in 1905 now average 23 $\frac{1}{2}$ ft. in height with a girth of 19 in. at 4 ft. above the ground.

***J. chinensis*, Linn.**—Chinese Juniper.

Elwes and Henry, l.c., p. 1430, refer to this tree as attaining a height of 60 ft. in China and Japan, but it occasionally grows 70-80 ft. high according to Sargent. "Forest Flora of Japan," p. 78. It is quite hardy in the British Isles, and is largely grown as a decorative tree or bush. In several places it has been recorded as being between 35-48 ft. high. In a young state it usually forms a dense bush, but old examples develop a distinct trunk with a more or less rounded head. The leaves are usually scale-like in character, but even on the oldest trees shoots occur with acicular leaves. The fruits are about $\frac{1}{3}$ in. in diameter, and they take two years to ripen. Although the wood is durable and useful for many purposes, that from burred trees being prettily marked, it is not obtainable in quantity and is of no importance in the timber market.

***J. communis*, Linn.**—Common Juniper, Ground Cedar.

A species widely distributed through Europe, Northern Asia and North America. In the European Alps it ascends to a considerable altitude and has been recorded at 11,900 ft. on Monte Rosa; it is commoner, however, between 6000-8000 ft. It is wild in the British Isles from the Surrey Downs to the Scottish Highlands, and also occurs in Ireland, but in each instance it inhabits certain areas rather than being a general plant. It is specially noticeable on chalk and varies a good deal in habit, for, though usually a spreading bush 3-12 ft. high, it may grow much taller and in some Continental countries attains a

height of 30–40 ft. with sometimes quite erect branches. The leaves are always acicular $\frac{1}{4}$ – $\frac{1}{2}$ in. long, green below with a silvery line on the upper surface. The berries are about $\frac{1}{3}$ in. in diameter, almost black when ripe and take 2 years to mature. The wood is too small for building purposes, but is used for fencing with satisfactory results. Elwes and Henry l.c., p. 1408, mention a fence of this timber with posts of oak which surrounds the royal deer park near Copenhagen, which in 1887 had been in existence about 100 years. In some Continental countries the wood is used for milk pails and other domestic articles, and in this country it has some value for walking-sticks. The fruits have been of commercial importance for a long period. They are used for flavouring gin and at one time a considerable quantity was exported from Scotland to Holland for the purpose. Some particulars of the trade were given by Thomas Thomson, M.D., in 1838, in the "Chemistry of Organic Bodies," p. 463. He there says: "The distillers of Schiedam were formerly in the habit of carrying over annually a shipload of juniper berries from Inverness, for the use of their distilleries." The fully grown but unripe berries are considered to be richer in oil than ripe berries. The oil is used for medicinal and for flavouring purposes. In the "Resources of the Southern States of America," by F. P. Porcher, 1869, pp. 187–188, juniper berries of certain species are said to be used with apples, pears and the fruits of *Amelanchier canadensis* in the preparation of a wholesome and refreshing drink, whilst a wholesome drink is also said to be formed by placing 30 lbs. of juniper berries in 38½ gallons of water and allowing fermentation to take place. The berries of the common juniper are used with beechwood in the smoking of Westphalian hams, the peculiar piquant taste of the hams being given by the juniper-berry smoke (Journ. Roy. Soc. Arts., Feb. 23, 1912, p. 416).

A very dwarf form *J. communis* var. *nana*, sometimes considered to be a distinct species, is found in some parts of Ireland.

J. drupacea, Labil.—Drupe-fruited Juniper, Syrian Juniper.

This is a very distinct species, native of Asia Minor and Syria, where it often grows 60 ft. high with a considerable girth. Under cultivation it is known as a narrow fastigate tree easily distinguished amongst other species by its large, acicular leaves which often exceed $\frac{1}{2}$ in. in length and $\frac{1}{8}$ in. in diameter. The fruits are larger than those of any other Juniper for they are sometimes 1 in. in length and $\frac{3}{4}$ in. in diameter. The fleshy outer part is said to be eaten by the inhabitants of regions where the species is common. Although the timber is reputed to be of good quality, the consumption is apparently quite local. In the Kew Museums the wood is poorly represented, there being but one small piece. That is from the Taurian Alps and shows about 220 annual rings in a diameter of 6 in.

J. excelsa, Bieb.—Grecian Juniper.

A tree widely distributed from the Balkans through South-East Europe to Asia Minor and Syria. It appears to attain its

maximum height, 70-100 ft., in Asia Minor, where it occasionally forms a trunk 4 ft. in diameter. In the British Isles the largest trees are about 35 ft. high. The majority of the leaves are scale-like, but small shoots with acicular leaves are sometimes found. The timber is reputed to be of good quality and has been recommended for railway sleepers.

***J. formosana*, Hayata.**—Prickly Cypress.

A species spread over a considerable area in China and also found in the mountains of Formosa. It was introduced to this country about the middle of last century, but is rare in cultivation and is usually met with under the name of *J. oblonga pendula*. Elwes and Henry l.c. 1415-1417, give some particulars about the tree and its distribution and say that it grows about 40 ft. high in China. It is, however, apparently the same tree to which Wilson refers in "A Naturalist in Western China," i. p. 176, when he says: "At Erb-tao-chiao I photographed a magnificent juniper tree 75 ft. tall, 22 ft. in girth with graceful pendent branches." The timber only appears to be of local use.

***J. macrocarpa*, Sibth.**—Large-berried Juniper.

This species is found as a bush or small tree throughout Southern Europe and in some parts of N. Africa. The leaves are acicular, often $\frac{5}{8}$ in. long, and the berries are up to $\frac{1}{2}$ in. in diameter. The fragrant wood appears to be used with that of *J. Oxycedrus* for distillation.

***J. macropoda*, Boiss.**—Himalayan Pencil Cedar.

A Himalayan tree widely distributed from Nepal to Afghanistan, often from 40-50 ft. high with a trunk 6-7 ft. in girth, but sometimes much larger. It appears to connect the Eastern *J. chinensis* with the Western *J. excelsa*, being nearest to the former species. Specimens of the wood in Museum No. III. at Kew have reddish heart-wood and yellow sap-wood. Writers on Indian timbers describe the wood as fragrant and moderately hard, and to be used for wall-plates, beams and fuel. A closely allied tree from the same region is *J. religiosa*.

***J. mexicana*, Schiede.**—Rock Cedar, Juniper Cedar, Mountain Cedar, Cedar.

This species is reported as forming forests on the limestone hills of Mexico and Texas where it sometimes reaches 95 ft. high. The wood is described as hard, weak, close-grained and brown. It is used for general construction, fencing, sills, telegraph poles, railroad ties and fuel.

***J. occidentalis*, Hook.**—Canadian Juniper, Californian Juniper, Western Red Cedar, Yellow Cedar.

Sargent, "Silva of North America," x., describes this tree as sometimes attaining a height of 40-50 ft., with a trunk 3 ft. in diameter, but it is usually much smaller and sometimes a mere bush. It is widely distributed in North-West America from Canada to California, and produces a heavy, close-grained

and fragrant wood, of good lasting quality, which is comparable to the rougher samples of *J. virginiana* and is used for fencing as it lasts well in contact with the soil.

J. Oxycedrus, Linn.—Sharp Cedar, Brown-berried Juniper.

This species is common throughout the Mediterranean region from sea level up to 5000–6000 ft., usually as a shrub but sometimes as a small tree. In Italy it occupies considerable areas on sand dunes. The leaves are acicular and resemble those of *J. Cedrus*. The principal use of the wood is for distillation, the oil extracted being known as “oil of cade.” Factories for the distillation of the oil are established in the Maritime Alps. The wood is cut into sections which, from their appearance, are called “cades gros” or “cades maigres,” the latter are used as fuel and the former placed in the still for the extraction of the oil. The oil is given off as a thick dark liquid, the density and darkness being determined by the amount of fire heat used in the distilling process. Oil of cade is used in medicine for skin diseases. Other kinds of juniper wood are reputed to be used as substitutes. An account of the preparation of this oil is given in the *Pharmaceutical Journal*, October 13, 1906, p. 413.

J. pachyphlaea, Torr.—Oak-barked Cedar, Thick-barked Cedar, Mountain Cedar, Chequer-barked Juniper.

A species differing from all others by reason of its thick, scaly bark which is responsible for two of the common names. Under favourable conditions it grows 50–60 ft. high and may be 12–15 ft. in girth. Leaves of both kinds are developed by mature trees. It is found wild in the dry regions of Texas, New Mexico and Arizona. The wood is soft, light red and close-grained. Samples at Kew are straight-grained and bear a resemblance to the wood of *J. virginiana* for which it could probably be substituted.

J. phoenicea, Linn.—Phoenician Juniper.

This is an important tree in the Mediterranean region for it is found in South Europe, North Africa, Cyprus and the adjoining mainland, the Canary Islands and Madeira, its timber being used for building purposes and for firewood. It varies in height from little more than a shrub to a tree of 40 ft. The leaves are small and scale-like and the fruits about $\frac{1}{3}$ in. in diameter. In 1913 Sir W. T. Thiselton-Dyer pointed out that the ‘Cedar of Lebanon’ of the Bible was a juniper and not *Cedrus Libani*, as stated in *K.B.*, 1913, p. 218. Sir J. D. Hooker in his article in “The Natural History Review,” on “The Cedars of Lebanon, Taurus, Algeria and India” (January, 1862), states—“The word cedar as used in the Bible, applies to other trees and only certainly to the *Cedrus Libani*, when coupled with some distinctive epithet. . . . It is in my opinion an open question whether the *C. Libani* is one of those which supplied most of the timber employed in building Solomon’s temple. The cypress (also called cedar by the ancients), the *Pinus halepensis* and the tall fragrant *Juniperus* of the Lebanon with its fine red heart-wood, would have been

far more prized on every account." *J. phoenicea* or *J. drupacea*, or both, were probably referred to in this note.

J. procera, *Hochst.*—East African Juniper or Cedar.

Attention has been directed to the timber of this tree during the last few years as a likely substitute for the wood of *J. virginiana* for pencil-making. It is found wild in the mountains of East Africa. The wood has a fine, straight, and almost even grain, a beautiful dark red colour, an even texture, a fragrant cedar-like odour, and is brittle, non-resinous, of light weight and nearly as soft as red cedar.

J. recurva, *Buch.-Ham.*

A tree of pendent habit with acicular leaves, native of the Eastern Himalaya. It grows up to about 40 ft. high, and Gamble, "A Manual of Indian Timbers," p. 698, says that the wood is quite equal to the best pencil cedar but is only used for burning as incense in the Buddhist temples. *J. squamata* from the Western Himalaya, China and Formosa is a closely allied species with very similar wood.

J. rigida, *Sieb. & Zucc.*

A shrub or small tree native of Japan, where, under the most satisfactory conditions, it grows about 30 ft. high. Its leaves are all acicular, slender and spiny, the fruits being globular and $\frac{1}{8}$ in. in diameter. The wood has good lasting properties, and though small, is put to many local uses.

J. Sabina, *Linn.*—Savin.

A species varying in habit from a prostrate shrub to a bush 12–15 ft. high. It is distributed through Central and Southern Europe, the Caucasus, North Persia and North America, and produces both acicular and scale-like leaves. The wood is of little value except for walking-sticks and firewood, but the fresh and dried shoots and leaves contain an oil which is extracted by distillation. Savin oil possesses medicinal properties and the best qualities are said to be obtained from fresh leaves. "The Perfumery and Essential Oil Record," May, 1914, p. 131, cautions readers that the so-called "oil of savin" passed into commerce from the South of France continues to be distilled from various species of *Juniperus*, including *J. phoenicea*, and possibly *J. thurifera*, and that there is a considerable difference between the oils. The only oil that should be accepted as true "oil of savin" being that of *J. Sabina*.

J. scopulorum, *Sarg.*—Red Cedar, Rocky Mountain Red Cedar.

This species forms a small tree 30–40 ft. high with a trunk 2–3 ft. in diameter. It is a native of the Rocky Mountains from Alberta to Western Texas and Westwards to British Columbia and Washington, nowhere very common. The wood is said to be useful for fencing, posts, etc., and to be very like that of *J. virginiana* but less useful.

J. thurifera, *Linn.*—Spanish Juniper, Incense Juniper.

A tree 20–40 ft. high with a trunk 2–4 ft. in diameter. Leaves of both kinds are produced and the fruits are about $\frac{1}{2}$ in.

in diameter. It is distributed through Spain, Portugal, Algeria and Morocco, etc. The wood does not appear to be used other than locally, although it is of good appearance and possesses good lasting qualities.

J. virginiana, Linn.—Cedar, Pencil Cedar, Red Cedar, Virginian Cedar.

This species is very widely distributed in North America, and it is the most satisfactory of the large-growing junipers in the British Isles, although it is not of very rapid growth. It is a very valuable species from a commercial standpoint for its wood is used more often than that of any other kind for the casings of lead pencils. Its distribution area ranges from about latitude 45° in Canada to the Gulf States, and from the Atlantic to the mountains that border the Pacific States. It varies from a bush to a tree 120 ft. high with a diameter of 3 ft. (Forest Planting Leaflet, Circular 73, United States Department of Agriculture). As much of the wood is knotty, and only straight wood can be used for pencils, there is a good deal of waste. Knotty wood unsuitable for pencil-making is, however, very useful for fences, railway sleepers, etc. The shavings and dust from pencil factories is distilled for the fragrant oil contained in the wood, the oil thus obtained being used for scenting soap and for other kinds of perfumery. A use has also been found for the shavings after distillation, for they make an excellent substitute for cocoanut fibre as a plunging material for horticultural purposes. The shavings being small are easily manipulated, and equal in preserving warmth and moisture to the fibre previously used which is now difficult to procure owing to its being largely employed for linoleum and other purposes. Moreover, the shavings are of advantage since fungi do not grow upon them.

J. Wallichiana, Hook. f.—Black Juniper.

According to Sir D. Brandis, "Indian Trees," p. 695, this is a variable species in the Himalaya reaching an altitude of 15,000 ft., sometimes being found as a small bush and at other times as a tree up to 60 ft. high. The wood appears to be used locally for building purposes.

IV.—MISCELLANEOUS NOTES.

Mr. R. O. WILLIAMS, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Royal Botanic Gardens, Trinidad.

Research in Jodrell Laboratory in 1915:—

Mr. L. A. Boodle examined the anatomy of several species of plants in relation to their affinities.

Dr. W. Gardiner studied some details in the structure of the sieve-tubes of *Angiopteris*.

Miss E. M. Jesson examined some peculiar structures in the glumes of certain Grasses.

Miss I. Massee made observations on several Fungi connected with diseases of plants.

Miss F. M. Scott made an examination of the anatomy of a hybrid *Cheiranthus*, and began some other anatomical investigations.

Mr. H. Takeda studied some new species of Freshwater Algae and *Flagellata*.

Mr. W. B. Turrill examined the anatomical structure of the leaves of certain Cycads and Grasses.

Mr. W. C. Worsdell studied a number of teratological specimens in relation to their morphological nature, and carried out investigations on the anatomy of the *Cucurbitaceae* and other Dicotyledons.

Pathology.—The routine work of the Pathological Department continues to be very heavy. During 1915 nearly 600 inquiries were dealt with, 316 of which were received through the Board of Agriculture and Fisheries. The work of answering these inquiries has during recent years been greatly simplified by the large number of the Board's leaflets now available. On the other hand many queries entail prolonged microscopic examination or book work, whilst others to be answered accurately and fully would demand original research. Routine work, therefore, seriously interferes with the larger pathological problems claiming investigation.

Considerable attention has been paid during the year to diseases of potato, wheat, and fruit trees, and energies have been devoted as far as possible both in routine work and research to those questions connected with important economic crops.

Additions to Gardens, 1915.—Exchanges were made with the Botanic Gardens of Cambridge, Oxford, Edinburgh, Glasgow, Liverpool and Glasnevin, and with some of the European gardens upon which Kew is largely dependent for seeds of those annual herbaceous plants which fail to produce seeds at Kew. Other donations to the Gardens include the following:—

From Botanic Gardens and other institutions;—

Kirstenbosch, Cape Colony—Stems of Cycads, various seeds. Singapore—Seeds of Palms; Filmy ferns.

Uganda—Seeds of tree Lobelia.

Trinity College, Dublin—*Amorphophallus Kerrii* and *A. corrugatus*.

Loanda, Angola—Seeds of Palms, etc.

Washington, Department of Agriculture—Seeds *Kokia Rockii*.

Gold Coast—Collection of Yam tubers.

John Innes Institute, Merton—Hybrid Primulas, etc.

Sierra Leone—Collection of Yam tubers.

Washington, Nat. Museum, U.S.A.—Collection of seeds from S. America.

Greenwich Park—*Meconopsis* sp., Primulas, Erigerons, etc.

Uganda—Seeds, *Baikaca insignis*, *Encephalartos* sp.; War-dian case of plants.

- Sydney, N.S.W.—Collection of seeds.
 New Zealand Government—Collection of varieties of *Phoridium tenax*.
 Penang—Filmy Ferns and Orchids.
 Pietermaritzburg—Orchids, Lycopodiums and bulbs.
 Dunedin—Seeds of *Celmisias*.
 Trinidad—Wardian case of plants.
 Mauritius—Seeds *Coffea macrocarpa*.
 British Honduras—Seeds of *Achras*.
 Abyssinia—H.M. Minister—Seeds of three varieties of *Eragrostis abyssinica* ('Teff').
 Donations from other sources include the following:—
 Mr. L. de Rothschild, Gunnersbury House—*Musa rhodochlamys*.
 Mr. H. N. Ridley, Singapore—Seeds of new Malayan plants.
 Mrs. Leschallas, Windlesham—Stove plants and Orchids.
 Dr. L. Cockayne, Wellington, N.Z.—Filmy ferns.
 Messrs. Bees, Liverpool—Seeds from Bhutan and China.
 Baron de Soutellinho, Oporto—*Ochna* sp. and *Camellia Thea* and *C. Sasanqua*.
 Mr. F. D. Godman, Horsham—Seeds from West Australia.
 Sir E. G. Loder, Bt., Leonardslee—*Rhododendron Loderi* and other plants.
 Col. S. R. Clarke, Cuckfield—*Dicksonia arborescens* and *Diplazium nigro-paleacum*.
 Miss E. M. Saunders—Collection of seeds from Murree.
 Miss Willmott, Great Warley—*Clematis aphylla*.
 Mr. H. J. Elwes, Colesborne—*Eria ornata*, *Annoectochilus lanceolatus*, *Arisaemas*.
 Mr. E. Scanes, Chingford—Various Cacti.
 Mr. J. Burt Davy, Johannesburg—Seeds *Protea* spp. and *Clematis Stanleyi*.
 Mrs. King-Farlow, Teddington Hall—Large specimen plant of *Asplenium nidus*.
 Mr. W. R. Dykes, Godalming—Iris.
 Mr. G. F. Berthoud, West Australia—Seeds of Compositae.
 Sir A. F. Hort, Bt., Harrow—Iris.
 Mr. E. Frosio, Uruguay—Seeds of *Pouteria suavis*.
 Mr. A. A. Goytisolo, Cuba—Seeds of Palms.
 Mr. C. J. Brooks, Sumatra—*Amorphophallus Titanum*.
 Mr. R. B. White, Gairlochhead—Cypripediums and Odontoglossums.
 Mr. C. H. Lankester, Costa Rica—Orchids.
 Hon. Charles Rothschild, Oundle—Iris.
 Mr. R. H. Beamish, Ashbourne—Herbaceous plants, *Anemone Fanninii*.
 Mr. F. Stoker, Acton—Collection of Orchids.
 Captain W. Kemp, Arundel—*Disa grandiflora*.
 Mr. R. L. Praeger, Dublin—Crassulas, Sedums, etc.
 Mr. M. Eley, Homelands—*Polypodium Dryopteris* var. *plumosum*.
 Mr. A. L. de Lautreppe, Putney—Collection of seeds and spores.

Mr. W. F. Lloyd, Siam—*Eulophia* sp.
 Mr. G. Elisha, Canonbury Park—*Mesembryanthemums*.
 Dr. G. V. Perez, Tenerife—Seeds of *Juniperus*, *Echium*, etc.
 Mrs. Lipscomb, Swanley—Orchids.
 Hon. Vicary Gibbs, Aldenham—Various hardy plants.
 Mr. M. T. Dawe, Girardot, Colombia—Seeds.

Among the purchases made was a portion of the collection of Orchids formed by the late Right Hon. Joseph Chamberlain, Highbury, Birmingham.

Surplus plants, chiefly hardy, were distributed as usual chiefly among public and teaching institutions.

There was the usual distribution of seeds ripened at Kew among botanic gardens and regular contributors of seeds, etc., to Kew. The total number of packets thus distributed was 1955 hardy herbaceous and 1075 hardy trees and shrubs.

Among the plants and seeds of interest distributed during the year were the following:—Teff (*Eragrostis abyssinica*); Tree Lobelia from Uganda; *Phormium tenax* vars.; Queensland Nut (*Macadamia ternifolia*); *Pouteria suavis*; *Berberis napaulensis* (true); *Juniperus Cedrus*, from Tenerife.

Arboretum.—The chief work during the early winter season has been the taking down of old trees, especially elms, which could no longer be considered absolutely safe. Among them were two of the "Seven Sister" elms. The removal previously of two other of these elms was recorded in the *Bulletin*, 1914, p. 33, and but one of the original seven now remains. Although several severe storms passed over Kew in November and December, the only loss of any note was the uprooting of one of the fine beeches growing a little north-west of the Azalea Garden. On this area which, in contrast to the greater part of the Gardens, has a deep loamy soil, the best beeches in Kew are now growing.

The removal of the numerous new trees and shrubs from the nurseries to their allotted sites in the grounds has been proceeded with. The greater part of the new introductions of Mr. E. H. Wilson from China (which have made the greatest showing in our nurseries during the past decade) have now been dealt with.

Additions to Tree and Shrub collections.—The disappearance of the firm of Messrs. James Veitch and Sons, of Chelsea, from the horticultural community has meant to Kew the loss of a very prolific source of new trees and shrubs, as well as of other plants. For many years their nursery at Combe Wood was visited regularly by members of the staff who, it may safely be said, never came back empty-handed. The war has practically closed the Continent to traffic of this kind, so that new additions to the collections in 1915 have been much below the average of the last few years. A consignment was received from the Arnold Arboretum early in the year containing, amongst other things, new hickories, oaks and poplars. From the same establishment came a plant of *Sargentodoxa cuneata*, which constitutes a new genus of Rehder and Wilson belonging to the *Lardizabalaceae*. It is a deciduous climber and is described as having pendulous

racemes of yellow flowers. Professor Sargent also sent some seeds collected by Mr. Wilson during his recent travels in Japan. Amongst them was a very welcome packet of seeds of *Rhododendron dilatatum*, a beautiful deciduous species which, hitherto, has been extremely rare in this country. They germinated very freely. Numerous seeds collected by Mr. Forrest in China were received, and from Messrs. Bees some seeds collected by Mr. Cooper in Bhutan. Mr. J. C. Williams made an interesting contribution in a white-flowered variety of *Erica australis*, collected by his son, the late Lieut. Robert Williams, in the south of Spain. This, so far as we know, is new to cultivation and to science. Mr. Gerald W. Loder gave Kew a plant of the very rare *Acanthopanax setchuenense*. Of this species there was, a few years ago, a bush in the Coombe Wood nursery raised from Wilson's seed which at that time appeared to be the only one in the country, but which went to the United States. A valuable collection of shrubs was received from the Edinburgh Botanic Garden that had been noted during an official visit by the Assistant Curator last May. An interesting addition to the Arboretum collection was a plant of *Stuartia serrata*, 5 or 6 feet high, given by Sir Edmund G. Loder, of Leonardslee. The Hon. Vicary Gibbs sent a number of rare species from his great collection at Aldenham. The establishment is also much indebted to the late Canon Ellacombe and to Mr. F. R. S. Balfour for valued contributions.

The following new trees and shrubs have flowered during 1915: *Alnus lanata*, *A. sitchensis*, *A. Spathii*, *Amelanchier pumila*, *Berberis sanguinea*, *Betula Medwediewi*, *Celastrus flagellaris*, *Clematis Fargesii*, *S. Pavoliniana*, *Cotoneaster salicifolia* var. *floccosa*, and var. *rugosa*, *Enkianthus himalaicus* (Chinese form), *Escallonia Balfourii* (pterocladon and rubra), *Euonymus sanguineus*, *Fraxinus Paxiana*, *Photinia subumbellata*, *Prunus Conradinae*, *P. Dielsiana* var. *laxa*, *P. polytricha*, *P. thibetica*, *Pyrus* (*Sorbus*) *Kocheana*, *P.* (*Sorbus*) *setsehwanensis*, *Rhododendron discolor*, *R. erubescens*, *Rosa Davidii* and var. *elongata*, *R. Gentiliana*, *R. Helenae*, *R. longicuspis*, *R. lucens*, *R. Rubus*, *R. Sweginzowi*, and *Syringa affinis*.

Museums.—Owing doubtless to abnormal circumstances there have been rather fewer donations than usual to the Museums during the past year. Those of special interest have been recorded from time to time in the *Bulletin*.

A large number of miscellaneous products have been received for determination, and much information has been supplied chiefly upon medicinal plants, oil-producing seeds and timbers.

The re-labelling of the permanent collections has gone on steadily. Owing to depletion of staff it has only been possible for the Timber Museum and the North Gallery to be open to the public, though visitors to the Gardens desiring access to the closed buildings for purposes of study have on all occasions been granted facilities for so doing. During the year 349 persons visited the collections for special study.

A collection of duplicate herbarium specimens, fruits and seeds of home-grown trees and shrubs was loaned to the Whitechapel Art Gallery for the Nature Study and Art Exhibition held during the spring.

Two cases have been placed in one of the rooms of Museum No. IV. for the display of a number of fruit models and of the Veitch collection of Coniferous fruits.

A successor to the late Mrs. Badderly was appointed as Caretaker of the North Gallery.

Additions to the Herbarium during 1915.—During the year about 20,000 specimens were received as donations or exchanges, and about 3000 acquired by purchase, while 400 were received on loan. The principal collections are enumerated below:—

EUROPE.—*Presented*: Britain, by Mr. C. E. Salmon; Switzerland, Matterhorn (E. Whymper), by Dr. W. Botting Hemsley; Italy, by Mr. C. C. Lacaita.

Purchased: H. Dahlstedt, *Taraxaca Scandinavica Exsiccata*, fasc. 3; Fiori and Béguinot, *Flora Italica Exsiccata*, Cent. xxi.-xxii.

ORIENT.—*Presented*: Kurdistan (Major Cowie, R.E.), by Mr. R. S. Hole.

ATLANTIC ISLANDS.—*Presented*: Tenerife, by Dr. G. V. Perez.

CHINA AND JAPAN.—*Presented*: China (F. N. Meyer), by the United States Department of Agriculture; (G. Forrest), by the Royal Botanic Garden, Edinburgh; Kansuh, by Mr. H. French Ridley; North River Expedition, by Mr. W. J. Tutchet.

JAPAN.—*Purchased*: H. Takeda.

INDIA.—*Presented*: Bengal and Burma, by Mr. J. H. Lace; Murree, by Miss Elsie M. Saunders; Madras, by the Madras Government Herbarium, through Mr. J. S. Gamble; Madras, by Sir A. G. and Lady Bourne; Malay Peninsula, by Messrs. H. N. Ridley, I. H. Burkill and F. T. Brooks.

Purchased: Dr. W. J. Treutler, Sikkim.

MALAYA.—*Presented*: Siam, by Dr. A. F. G. Kerr, Phra Vanpruk and Mrs. D. J. Collins; Philippine Islands, by Mr. E. D. Merrill.

AUSTRALIA.—*Presented*: New South Wales, by Mr. J. H. Maiden; Western Australia, by Dr. F. Stoward, and (Dr. Alexander Morrison) by the Royal Botanic Garden, Edinburgh, and (C. B. Carter) by Mr. F. Du Cane Godman; Fungi (W. N. Cheesman) by Miss E. M. Wakefield.

NEW ZEALAND.—*Presented*: Fungi (W. N. Cheesman) by Miss E. M. Wakefield.

TROPICAL AFRICA.—*Presented*: Sierra Leone, by Mr. N. W. Thomas; Sierra Leone and Lagos, by Dr. J. M. Dalziel; Northern Provinces, Nigeria, by Mr. E. W. Foster; Southern Provinces, Nigeria (C. O. Farquharson), by Mr. W. H. Johnson and Mr. M. D. W. Jeffreys; Somaliland, by Dr. R. E. Drake-Brockman; British East Africa, by Mr. W. J. Dowson; Uganda, by Messrs. T. D. Maitland, W. Small and R. A. Dümmer.

Purchased: R. A. Dümmer, British East Africa and Uganda.

SOUTH AFRICA.—*Presented*: From various localities, by the Bolus Herbarium and Mr. W. C. Worsdell; Basutoland (Mrs. A. Dieterlen), by the South African Museum; Natal, by Dr. J. Medley Wood; Percy Sladen Expedition Compositae, by Professor H. H. W. Pearson.

Purchased: Miss Alice Pegler, Transkei Fungi.

NORTH AMERICA.—*Presented*: Greenland Algae (E. Whymper and Rob. Brown), by Mr. H. N. Dixon; Wisconsin (E. J. Palmer), by the Arnold Arboretum; Bermudan and Floridan mosses, by Mrs. E. G. Britton; Bermudan Algae, by Mr. F. S. Collins.

SOUTH AMERICA.—*Presented*: Colombia, near Bogota, by Mrs. J. A. Tracey.

GENERAL.—*Presented*: Roses, by Mr. J. G. Baker.

Some plants collected by Mr. E. Whymper in 1862 on the South side of the Matterhorn, between 11,500 and 13,000 ft., have been presented by Dr. W. Botting Hemsley. A collection made by Major Cowie, R.E., during the Turco-Persian Frontier Delimitation Expedition, 1914, has been received through Mr. R. S. Hole. Critical species, wild or cultivated in Tenerife, have been presented by Dr. G. V. Perez. The Royal Botanic Garden, Edinburgh, has contributed Chinese specimens collected by Mr. G. Forrest and Western Australian ones from the herbarium of the late Dr. Alexander Morrison. Mr. W. J. Tutcher has presented a set of the specimens he collected in 1914 during the North River Expedition. Mr. J. H. Lace has continued to give specimens collected by him in Burma and Bengal. The collections made in Penang and Selangor by Messrs. H. N. Ridley and C. Boden Kloss have been named at Kew by the former, who has presented them. The large Indian herbarium formed by Sir Alfred and Lady Bourne, between 1896 and 1914, has been presented by them; it consists mainly of Madras plants, but also contains some collected in Simla in 1902. The Sikkim herbarium of the late Dr. W. J. Treutler has been acquired by purchase. Fresh instalments of Siamese plants have been received from Dr. A. F. G. Kerr, Phra Vanpruk and Mrs. D. J. Collins. Mr. E. D. Merrill has contributed a valuable collection of about 2500 Philippine plants. The Australian collection has been enriched by consignments from Dr. F. Stoward, the Government Botanist for Western Australia. Additional Sierra Leone plants have been sent by Mr. N. W. Thomas, and collections from Uganda by Messrs. T. D. Maitland, R. A. Dümmer and W. Small. The Percy Sladen Expedition Compositae (determined at Kew by Mr. J. Hutchinson) have been presented by Professor H. H. W. Pearson. Mrs. A. Dieterlen's Basutoland plants have been presented by the South African Museum. Various South African plants have been received through the Bolus Herbarium and Mr. W. C. Worsdell. Greenland Algae collected by Messrs. E. Whymper and Robert Brown have been presented by Mr. H. N. Dixon. The specimens used as types in the preparation of Miss Willmott's book, *The Genus Rosa*, have been presented by Mr. J. G. Baker.

Presentations to the Library during 1915.—The issues for the year of the periodical and serial publications, now nearly forty, received in exchange for *Hooker's Icones Plantarum*, have been presented by the Bentham Trustees. Owing to the War the number has not been so large as usual. The Trustees have also presented a copy of the Paris edition, dated 1849, of the *Semario de la Nueva Granada*, issued under the direction of F. J. de Caldas; a volume containing an account of the late Mr. Edouard André's travels in Tropical South America, under the title of *L'Amérique équinoxiale*, a series of articles collected from *Le Tour du Monde*, vols. xxxiv.-xlv., 1877-83, and a copy with coloured plates of Triana's *Nouvelles études sur les Quinquinas*, apparently rather scarce in this condition.

The weekly issues of the *Comptes Rendus* of the Academy of Sciences, Paris, have been presented by Lady Hooker, and those of the American journal *Science* by Miss Alice Eastwood, Curator of the Herbarium of the Californian Academy of Sciences.

Another volume of Mr. William Foster's work, *The English Factories in India*, dealing with the period 1651-1654, has been received from the Secretary of State for India.

Sir Frank Crisp, Bart., has contributed a scarce little volume, unfortunately imperfect, of which the title, since added in manuscript, is: *Erbario che in 32 tavole contiene la figura de 128 piante con la dichiarazione delle virtù e proprietà di ciascuna*. It is attributed to Pietro de Nobili, and its date is probably about 1636.

The fifth volume of the *Catalogue of Books . . . in the British Museum (Natural History)* has been presented by the Trustees. This work supplies a most valuable bibliography of natural history, and its usefulness at Kew may be estimated by the frequency with which it is consulted. Another volume, which will include the additions to the library received during the printing of the five now published, is contemplated and its appearance, it is hoped, will not be long delayed.

Professor M. C. Potter has presented a set of the first eleven volumes of the *Journal of the Board of Agriculture*, and Sir David Prain nineteen volumes of the *Gardeners' Chronicle*. Both these sets have been deposited in the new Pathological Laboratory.

The publications of the Botanical Museum of the University of Zurich, distributed during the year, have been sent to the library by Professor Hans Schinz. These include *Die Flora des Val Onsernone*, by J. Baer; *Vegetationsstudien im Bormiesischen*, by E. Furrer; *Beiträge zur Pflanzengeographie des Kantons Schaffhausen*, by E. Kelhofer; and *Flora des Traverstales und der Chasseronekette*, by C. Wirth. Professor Schinz has also sent the first part of the volume, edited by him and A. Guillaumin, containing the botany of the work on New Caledonia, by F. Sarasin and J. Roux, and vol. 50 (centenary volume) of the *Neue Denkschriften der Schweizerischen Naturforschenden Gesellschaft*.

The numerous and valuable publications of the Department of Agriculture in the Dutch East Indies, sent to Kew by the Direc-

tor, include *Malayan Fern Allies*, by C. R. W. K. van Alderwerelt van Rosenburgh, and *Catalogus Herbarii Plantarum in Horto Bogoriensi cultarum*, by I. Boldingh.

Two further parts of *Nova Guinea: Résultats de l'Expédition scientifique néerlandaise à la Nouvelle Guinée en 1912 et 1913*, containing Laubmoose, by M. Fleischer, and Ericaceae, Orchidaceae, etc., by J. J. Smith, have been received from the Maatschappij ter Bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën.

The Journal and Proceedings of the Asiatic Society of Bengal, which, up to the time of his death in December, 1911, was presented by Sir J. D. Hooker, is now being received from Major A. T. Gage, of the Royal Botanic Garden, Calcutta.

The two handsome volumes containing Mr. T. F. Cheeseman's *Illustrations of the New Zealand Flora* have been contributed by the Minister of Internal Affairs, New Zealand, through the kind offices of the author. The title-pages are dated 1914, but there appears to have been some delay in distributing the work, for the Kew copy did not arrive till December, 1915.

Mr. and Mrs. Clement Reid's investigations on the Pliocene Floras of the Dutch-Prussian Border have resulted in the publication of a quarto volume which forms No. 6 of the *Mededeelingen van de Rijksopsporing van Delfstoffen*, a copy of which has been received from the Director of the Rijks Herbarium, Leiden. It includes 20 plates of photographs of fruits, seeds and other plant-remains, the identifications of which are of the greatest interest to workers among existing plants as well as to palæobotanists, and of especial value in tracing the origin and distribution of floras.

The Director of the Faculty of Medicine of Buenos Aires has presented a copy of the first volume of a work entitled *Archives inédites de Aimé Bonpland*. This contains unpublished letters, reproduced in facsimile, of Alexander von Humboldt. The fifth volume of the *Acta Horti Bergiani* has been received from the Director of the Garden, Dr. R. E. Fries, and the fourth volume of Dr. Hayata's *Icones Plantarum Formosanarum*, from the Director of the Bureau of Productive Industries, Formosa.

Professor Silvanus P. Thompson has given to Kew the copy of Sir J. E. Smith's *Compendium of the English Flora*, which was formerly owned and used by his grandfather, Mr. John Tatham, who noted in it the localities of the plants found by him in the Settle District. Mr. Tatham's British Herbarium is now at Kew, having been presented by Professor Thompson in 1913.

The establishment is indebted to the following, among many others, for accessions to the library:—Mr. I. H. Burkill, for *Notes on experiments on the different kinds of Timber in ordinary use in the Straits Settlements*, by H. Newton, a scarce tract; Mr. A. D. Cotton, for several publications on Algae; Mr. W. Dallimore, for a copy of *The Practical Fruit Gardener*, by S. Switzer, ed. 2; Mr. J. Ramsbottom, for the *Systematic arrangement of Australian Fungi*, by D. McAlpine; Mr. R. V. Sherring, for a complete set (6 volumes) of the *Proceedings of the Bournemouth Natural Science Society*; the Secretary of Agriculture,

Sydney, for the *Forest Flora of New South Wales*, by J. H. Maiden, part 55; the Director of the Rothamsted Experiment Station, for various reports of the Station, *Inorganic Plant Poisons and Stimulants*, by W. E. Brenchley, and *Soil Conditions and Plant Growth*, by E. J. Russell; Director of the Botanic Garden, Utrecht, for *Indisch Natuuronderzoek*, by M. J. Sirks; the Director-in-Chief of the New York Botanical Garden, for the continuation of the *North American Flora*; the Under-Secretary for Public Lands, Queensland, for the *Report of the Prickly-Pear Travelling Commission*, by T. Harvey Johnston and H. Tryon; the Agricultural Adviser to the Government of India, for the publications of the Agricultural Research Institute, Pusa; the Agricultural Society of Madeira, for *Flora do Archipelago da Madeira*, by C. A. de Menezes; and to the Secretary of Agriculture, Washington, for liberal contributions of the ever-useful publications of the United States Department of Agriculture.

Presentations of books and pamphlets by their authors include:—*Orchidaceae: Illustrations and studies of the family*, by Oakes Ames, fasc. 5; *Araldica Nicotianae*, by G. E. Anastasia; *Les Palmiers de la Côte d'Azur*, by B. Chabaud; *The Flora of the Nilgiri and Pulney Hill-tops*, by P. F. Fyson; *The Mutation Factor in Evolution*, by R. R. Gates; *The Cherries of New York*, by U. P. Hedrick; *Studies on the Vegetation of Cyprus*, by J. Holmboe; *Opmerkingen over eene Buitenzorgsche Kritiek op mijne Exkursionsflora von Java*, by S. H. Koorders; *Bitter Pit Investigation*, by D. McAlpine, 2nd, 3rd and 4th reports; *A Critical Revision of the genus Eucalyptus*, by J. H. Maiden, parts 22 and 23; *Catalogue of Japanese Plants . . . in the Herbarium of the Natural History Department, Tokyo Imperial Museum*, by T. Makino and K. Nemoto; *Shokubutsu-Mei-i*, part 1, *Chinese names of Plants*, by J. Matsumura; *Recherches . . . sur les Radis cultivés*, by Y. T. Riolle; and *Check-list of the Bryophyta of South Africa*, by T. R. Sim.

Manuscript additions include a Catalogue, written by Lady Bourne, of the Plants collected by Sir Alfred and Lady Bourne chiefly in Madras, from 1896 to 1914. From Mr. N. W. Thomas have been received seven foolscap folio volumes containing the list of the native names of the Plants of Sierra Leone; and to Mr. Du Cane Godman the Library owes a slip catalogue of additions to the botanical bibliography of Central America, compiled by Dr. W. Botting Hemsley, and intended for the supplementary volume of the *Biologia Centrali-Americana*, but so far unpublished. Mrs. C. B. Dickson has presented her coloured drawings of 480 British Fungi and 49 Flowering Plants, arranged in two large volumes. Botanical names, localities and dates are supplied with the drawings which are of considerable merit.

The complete list of additions made to the Library during the year will appear in Appendix II. to the *Kew Bulletin*, 1916.